The Institution of Engineers, Australia; Sydney Division
**Engineering Heritage Committee**

# ORAL HISTORY PROGRAM

INTERVIEWEE: **Peter Stroud LANGFORD**

INTERVIEWER: **David W. Butcher**

INTERVIEW DATE: **01 March 1999**

RESTRICTION ON USE: **None**

TAPE NUMBERS:
**IEA SYD: DWB 1, DWB 2, DWB 3, DWB 4.**

NUMBER OF TAPES: **4**

# INTERVIEW TAPE LOG

This interview took place at Peter Stroud Langford's home at
4/132 Junction Lane
Wahroonga
N.S.W. 2076

on 01 March, 1999.

This interview is part of the Oral History Project of the Engineering Heritage Committee of Sydney Division, The Institution of Engineers, Australia.

## Tape Log

| Tape: IEA SYD: DWB 1, Side A | | |
|---|---|---|
| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-005 | Tape Identification | |
| 005-014 | **Born** Sydney (Killara) 09.Nov.1920.<br>Parents living in New Guinea ( at Upoia on Vailala River in Gulf of Papua) at time and mother returned to her parents home in Killara for his birth.<br>Went back to New Guinea as 6 week old baby.<br>Father was a mining engineer and geologist. | Sydney, Killara.<br>Upoia, Vailala River, Gulf of Papua, New Guinea. |
| 014-046 | **Schooling** -first Dalcross, Pymble (Sydney).<br>Father moved to Wyong - first 5 years primary school at Wyong Public School - left end 1931.<br>Started Barker College 1932-Leaving Certificate 1937 and 1938. Dux of school 1937 and 1938.<br>Subjects- Maths, Physics, Chemistry, English, Mechanics. Participated in all activities of school life - Vice Captain of School plus Vice Captain of Cricket, Football & Athletics.<br>In 1938 awarded Sir Thomas Anderson Stuart Medal for leadership and scholarship ability. | Dalcross school, Pymble.<br>Wyong Public School.<br>Barker College.<br><br>Sir Thomas Anderson Stuart Medal |
| 046-139 | **Sydney University** - 1939 to 1942 - Engineering.<br>Originally considered civil engineering (father an engineer) but selected aeronautical as was a new form with a future in Australia and was only a small faculty - 1942 was 3rd graduating year with 7 people.<br>One graduated 1940 & 7 people in 1941.<br>Aeronautical was conglomerate of other courses and included structures, fluid dynamics, electrical & mechanical engineering, electronics, etc.<br>Did general course - no specialisation.<br><br>Hawker de Havilland Ltd approached University in 1942 (World War II was on) and 1942 final year seconded on masse to do testing and stress design to assist company in work on a troop carrying glider.<br>Glider was for 7 fully armed troops, company had concept design but not manpower for full design and prototype was being built in factory at Camperdown.<br>Students used academic staff as mentors. Stress design encompassed wings, fuselarge, control system & control surfaces. Peter Langford did physical testing - wind tunnel, aerodynamic, structural loads.<br>Work completed - glider built and flew.<br>A number built but not used in active service.<br>At least one continued flying after War and used as test vehicle at Aeronautical Research Laboratories and at Aircraft Research & Development Unit (ARDU) of RAAF at Laverton. Research areas included "suck wing" - to suck air off wing top surface to improve flow, "thick" wings, etc - all useful as no interference from propeller slip steam. | Sydney University.<br>Aeronautical Engineering.<br><br>Hawker de Havilland Ltd<br><br>Testing & Stress Design.<br>Troop carrying glider.<br><br>Camperdown factory.<br><br>Aeronautical Research Laboratories.<br>Aircraft Research & Development Unit.<br>ARDU, RAAF.<br>"suck wing", "thick" wing. |

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| | Shared thesis with Basil Scholes - they studied 'Boundary layer flow phenomenon on a flat plate' - aim of each thesis in early stages of Aeronautical Department was to produce equipment for subsequent years. | Propeller slip stream.<br>Basil Scholes.<br>Boundary layer flow. |
| 139-195 | **1943 joined CAC - Commonwealth Aircraft Corporation** - as Assistant Design Engineer.<br>Had wanted to join RAAF after university but 'Manpower' decreed that whole of 1942 final year must go into work force, as engineers required in various places particularly CAC.<br>CAC just started design new fighter CA15 - similar to Mustang but with more powerful engine (Griffon) - and wanted more engineers.<br>'Manpower' - this organisation controlled who could and who could not join the armed services. Had 'Manpower' officers attached to various universities and industries - Sir Ian Clunies-Ross was "Manpower' rep attached to Sydney University.<br>At CAC Peter Langford concentrated on flight testing and was doing this when left CAC end 1944.<br>People at CAC who affected his career:<br>• Ian Fleming - CAC's Chief Aerodynamicist - his boss while doing flight test works.<br>• Doug Humphries - structures person.<br>• Fred David - Senior Design Engineer. | Commonwealth Aircraft Corporation (CAC).<br>'Manpower" organisation.<br>CA15, Mustang.<br>Griffon engine.<br>Sir Ian Clunies-Ross<br>Ian Fleming<br>Doug Humphries<br>Fred David |
| 195-214 | **1943 RAAF Elementary Flying School (EFTS).**<br>Decision made in 1943 that people doing aeronautical engineering should undergo flying training as part of course to give appreciation of vehicles they were involved in from engineering point of view. Was made retrospective to those already graduated who available to do training.<br>Peter Langford went Benalla (Victoria) - No.11 EFTS and completed training in Tiger Moths. | RAAF Elementary Flying Training School (EFTS).<br>Benalla, Victoria.<br>No.11 EFTS<br>Tiger Moths |
| 214-273 | **1945-46 RAAF Flying Officer - Engineering.**<br>Released by "Manpower" end 1944 - went officer training school into maintenance and posted No.5 Aircraft Depot, Wagga.<br>World War II ended and nearest got to combat was maintenance group in Sydney. | RAAF officer training school.<br>No.5 Aircraft Depot, Wagga.<br>Maintenance. |
| 273-373 | **1946 joined Dept. of Civil Aviation (DCA)** in Melbourne as Senior Aeronautical Engineer (Structures) - this role till 1954. DCA short staffed, saw as growing area - wanted to grow with it.<br>Had married Melbourne girl and liked idea of living Melbourne.<br>When joined DCA,<br>• was base grade aeronautical engineer.<br>• salary 432 pounds per year.<br>• worked for Supervising Aeronautical Engineer.<br>In DCA in those days after war, promotion was fairly fast to being responsible as sectional engineers | Dept. of Civil Aviation (DCA).<br>Senior Aeronautical Engineer (Structures).<br>Melbourne |

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| | in charge particular engineering categories, eg.<br>• performance and flight testing.<br>• structures - Peter Langford was this.<br>• power plants.<br>• electrical, etc……<br>DCA later expanded to include Aircraft Inspectors who became Aircraft Surveyors (people who had come up through maintenance ranks).<br>Significant projects worked on at DCA included:<br>• Setting up airworthiness standards.<br>• Writing & issuing series of documents called Air Navigation Orders (ANO's).<br>• Classification of Service Bulletins which came out from manufactures and decide whether they would be mandatory and whether they would be required on operating Australian aircraft or whether to let them be optional at the discretion of the operators.<br>• Approve all modifications and changes done to an aircraft. In those days, all changes had to be submitted to DCA and approved by DCA engineers.<br>• Tested aeroplanes (Flight Test people) to determine what their performance characteristics were from the point of take off and landing distances to our standards which were different to standards which applied overseas.<br>• Generally - the preparatory setting up of how DCA was to operate in the future. | performance & flight testing.<br>structures.<br>power plants.<br><br>Aircraft Inspectors.<br>Aircraft Surveyors.<br>maintenance.<br><br>Airworthiness standards.<br>Air Navigation Orders (ANO's)<br>Service Bulletins.<br><br>Flight testing.<br><br>Setting up DCA. |
| 373-401 | <u>1954 - appointed Supervising Aeronautical Engineer (DCA)</u> -located Melbourne - this role till 1957. Responsible for all engineering technical aspects including ones previously plus work of technical experts from maintenance side. Did not include maintenance standards, licensing of engineers, licensing of manufacturing industry, all of which came under Supervising Airworthiness Surveyor. | Supervising Aeronautical Engineer<br><br>Maintenance standards.<br>Licensing of engineers & manufacturing industry.<br><br>Supervising Airworthiness Surveyor |
| 401 | End of Tape IEA SYD: DWB 1, Side A | |

## Tape Log

| Tape: IEA SYD: DWB 1, Side B | | |
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| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-003 | Tape Identification | |
| 003-045 | DCA Supervising Aeronautical Engineer - role in event of crashes in Australia or overseas:<br>1). Not investigate accidents but specialist engineers seconded as technical support to separate Accident Investigation Branch as required in event of an investigation.<br>Accident Investigation Branch consisted basically of people with pilot background and had no technical engineers. Later name changed to Safety Investigation Branch.<br>2). From airworthiness viewpoint - as result of accident (here or overseas), need to decide what to do with aeroplanes currently flying.<br>Whenever serious accident/incident (i.e. with large passenger aircraft) occurred in operation or airworthiness here or overseas, Director General (DCA) - Sir Donald Anderson used to immediately call meeting of<br>• Managing Director Ansett - Sir Reginald Ansett plus his senior technical staff.<br>• General Manager of TAA - John Ryland plus his senior technical staff.<br>• General Manager of QANTAS - Bert Richie plus his senior technical staff.<br>• senior people from DCA.<br>and started off meeting by saying "I think we should ground the aircraft - what do you think Peter?"<br>and it was then Peter Langford's job to say why they should not be grounded. This always set the scene for the discussions. Usually came up with solution acceptable to all concerned and often involved dispatch of someone overseas to the site of the accident. This gave a position of strength from which to operate. | Supervising Aeronautical Engineer<br><br>Accident Investigation Branch<br><br>Safety Investigation Branch<br><br>Airworthiness.<br><br>Accidents, incidents.<br><br>Director General (DCA) - Sir Donald Anderson.<br><br>Managing Director Ansett - Sir Reginald Ansett.<br>General Manager of TAA - John Ryland.<br>General Manager of QANTAS - Bert Richie.<br>DCA. |
| 045-101 | 1957 appointed Director of Airworthiness (DCA) and to 1975 occupied positions of<br>• **DCA** - Senior Assistant Director-General (Airworthiness)<br>• **Dept of Transport (DOT)** - Senior Assistant Secretary (Airworthiness).<br>As Director of Airworthiness, additional responsibilities included,<br>• Branch which looked after maintenance (refer Tape DWB 1, Side A - Tape Counter 373-401).<br>• Clerical Office of Airworthiness - includes licensing of Maintenance Engineers (i.e. office has regulatory functions as well as office management functions). | Director of Airworthiness (DCA).<br>Senior Assistant Director-General (Airworthiness) - (DCA).<br>Dept. of Transport (DOT).<br>Senior Assistant Secretary (DOT).<br><br>Clerical Office of Airworthiness. |

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| | Name for position of Director of Airworthiness was previously called Superintendent of Airworthiness & Aeronautical Engineering.<br>Airworthiness Inspectors - originally inspected aircraft - became Airworthiness Surveyors - change from inspection to surveillance. Airworthiness inspections each year - complete strip down / check / put back into service - applied to all aircraft, large & small. Major maintenance & major modifications had to be inspected by DCA inspectors and cleared before aircraft could go back into service. As industry became more competent and maintenance engineering grew and became more specialised, job became one more of surveillance of a maintenance system, rather than inspection of aircraft.<br>Airlines required to have maintenance manuals which detailed what they did. DCA approved their training schools and set their examinations. DCA did spot checks on aircraft to see maintenance done properly and to check paperwork to see appropriate people had done their jobs as the work went along. This applied in case of airlines and for general aviation - to the organisations who did the maintenance for them.<br>With original 100% inspection practices, planes would have never got off the ground - conversion to the surveillance system was a very big change.<br><br><u>Change from DCA to DOT</u> and to position of Senior Assistant Secretary (Airworthiness) - DOT - occurred after the government led by E.G.Whitlam came to office (December 1972). Part of Whitlam government policy was to co-ordinate transport - air, sea (including lighthouses) and land (prior no control over land except provision of money) - to better manage the country's resources - very ambitious - did not work.. Government brought person who had been doing the same thing for Canadian government - engineer Charles Holten and he headed the DOT. DOT combined DCA and Dept. of Shipping & Transport. DCA larger of two and generally larger number of competent people - so DCA people tended to take senior positions.<br>Change made no change to air safety. | Superintendent of Airworthiness & Aeronautical Engineering.<br><br>Airworthiness Inspectors.<br>Airworthiness Surveyors.<br><br>Surveillance.<br><br>E.G.Whitlam<br><br>Co-ordinate transport - air, sea and land.<br><br>Charles Holten<br>Dept. of Shipping & Transport. |
| 146-178 | <u>1975-76 DOT - Regional Director (Victorian/ Tasmanian Region)</u> - based in Melbourne.<br>Responsible for management of these two States from a transport point of view, covering<br>• Aviation - all civil aviation activities from a management point of view.<br>• Lighthouses, Shipping, Receiver of Wrecks.<br><br>Responsibility for civil aviation technical - eg. airways engineering, remained with Airways Engineering Group at Head Office and Peter | DOT - Regional Director (Victorian/Tasmanian Region).<br><br>Aviation.<br>Lighthouses.<br>Shipping.<br>Receiver of Wrecks.<br><br>Airways Engineering Group. |

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| | Langford's staff went direct to this Engineering Group. Regional Director's role was to provide the environment and finance (spent $ properly) for the technical branch heads to get on and do their work. | |
| 178-239 | 1977 - Director (N.S.W. Region) -based in Sydney. After Whitlam government's dismissal in 1975, the new government decided to return to two separate departments - became Regional Director (N.S.W. Region) Department of Aviation based in Sydney and held this position till 1983.. Same role as Victorian/Tasmanian Region but bigger as N.S.W. larger region but shipping and other transport areas removed from responsibilities. Same role as previously in Dept. of Civil Aviation.<br>Department change 'political' - Civil Aviation somewhat resented previous change and often jealously guarded their areas. Changes cost a lot of money - every piece of paper and equipment - new decals, logos, etc.. and all had to be changed - was done twice in a period of 2 to 3 years!!<br>Done again when government formed Civil Aviation Safety Authority (CASA) and Federal Airports Corporation (FAC) which looks after airports. | DOT - Director (N.S.W.Region)<br><br>Regional Director (N.S.W.) Department of Aviation<br><br>Civil Aviation Safety Authority (CASA).<br>Federal Airports Corporation (FAC). |
| 239-283 | Retired - 1983.<br>Has been out of airworthiness since about 1975 and people acting as consulting engineers do it. Outlined legal aspects & requirements - play big role now. | Legal requirements. |
| 283-399 | **Discussed various experiences in career : -**<br>**1). Specific Matters.**<br>**2). Representing the Department overseas**<br><br>**1.1). Policy - aircraft structures life / metal fatigue.**<br>Metal fatigue greatest problem in aircraft in Australia since World War II. Fatigue first came to notice when a Stinson crashed (thinks during War in 1945). Framework had been modified - fatigue failures occurred at welded joints. Decision made to research in Australia at Aeronautical Research Laboratories (ARL) the load patterns experienced by aircraft.<br>Another plane (Vickers Viking) crashed in Africa due failure of wing in ordinary flight.<br>Arthur (H.A.) Wills - then ARL head of structures - analysed applied loads and using understanding and knowledge of aluminium, wrote paper for journal of Institution of Engineers, Australia. Paper based on hypothesis by fellow called Miner - called Miner's Hypothesis - but had no proof.<br>In October 1951, a wing fell off de Havilland Dove in Kalgoorlie - plane new aircraft which had only flown approx. 8,000 hours. Only two operating in Australia at time -both owned by Airlines of Western Australia. Flew to Kalgoorlie from Perth in second aircraft. | aircraft structures life/metal fatigue<br><br>Stinson<br><br>Aeronautical Research Laboratories (ARL).<br>Vickers Viking.<br><br>Arthur (H.A.) Wills<br><br>Miner.<br>Miner's Hypothesis.<br>de Havilland Dove.<br>Kalgoorlie.<br><br>Airlines of Western Australia |
| 399 | End of Tape IEA SYD: DWB 1, Side B. | |

## Tape Log

| Tape: IEA SYD: DWB 2, Side A | | |
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| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-004 | Tape Identification. | |
| 004-393 | Continuing from Tape IEA SYD: DWB !, Side B :-<br>In October 1951, a wing fell off de Havilland Dove in Kalgoorlie - plane new aircraft which had only flown approx. 8,000 hours. Only two operating in Australia at time -both owned by Airlines of Western Australia. Flew to Kalgoorlie from Perth in second Dove. Centre section spar (where failure had occurred) pulled from wreckage - found 40% of lower boom of spar had cracked in fatigue - failure had occurred with a single static load. Checked second aircraft which had come up from Perth - found crack of same size in spar of that aircraft as well. Subsequent checks revealed on both aircraft, small cracks on spar on other side.<br>These results dramatic - set DCA on 'path of fatigue' which has never stopped since and Peter Langford on a personal specialisation in his life.<br>Proved Miner's Hypothesis, as proposed by Arthur Wills, had some significance - these things would happen in the life of civil aircraft. Decided very little known about fatigue in Australia - ARL had done some test work but had not been applied. Steel had a fatigue limit - if load below a certain amount, no matter how many cycles , will not fail. Aluminium does not have a fatigue limit - no matter what level of stress, some damage is done.<br>Several things critical, such as:<br>• new material was used in aircraft.<br>• Martin 202 crashed in America about same time - aircraft very similar to Dove.<br>• Did not know how our standards should be - or what overseas (eg. UK or USA) had.<br>Decision was made send Peter Langford - as Senior Aeronautical Engineer (Structures) to UK to talk de Havilland, Air Registration Board (UK) - similar our Airworthiness group, researchers and industry and also to USA. To come back and make recommendations on what we should be doing re determining life of our structures. Spent 6 weeks UK and 6 Weeks USA.<br>062 Found the following:<br>a). Material used in Dove different from what used pre-war which had been generally known as 24ST - aluminium alloy with copper. Later materials, which contained zinc were 75ST in USA and DTD363 in UK. (DTD= Director of Technical Development). Addition of zinc increased Ultimate Tensile Strength (UTS) of material and Limit Strength considerably - | de Havilland Dove.<br>Airlines of Western Australia.<br>DCA.<br>Miner's Hypothesis.<br>Arthur Wills.<br>ARL.<br>Fatigue Limit.<br>Martin 202.<br>De Havilland.<br>Air Registration Board (UK).<br>24ST material.<br>75ST material<br>DTD363 |

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| | but did not change fatigue characteristics. Aircraft being designed with high stresses but with characteristics same as previous materials at those stresses - so operating in more damaging environment.<br>b). Materials to be not sensitive - i.e. stress concentration effects far more critical than for 24ST materials.<br>c). Dove only aircraft which had been fatigue tested. Limit Stress tested and conclusion had been this stress did not occur often enough to cause a fatigue failure - nowdays we know !!!!<br>Felt if work out life (number of cycles to failure) with mean stress and apply factor of 3 - we could be somewhere "in the ball park" - but not sure !!! | |
| | While in UK visited Fokker in Holland - they had bit of information. | Fokker, Holland. |
| | Left UK with all known there at time and methods of inspection (remembering affected parts usually hidden !!) and went to USA. Felt USA not know as much as UK and they leaning from him. In USA went to manufacturers, research establishments, NASA at Langley Field and Alcoa in Pennsylvania. | NASA, Langley Field.<br>Alcoa, Pennsylvania. |
| 138 | At return, Peter Langford felt knew as much as anyone and that not much ! - wrote report (about 2 inches thick) and sent copes to UK and USA and this<br>• set pattern going for assessment of fatigue generally.<br>• gave base philosophy.<br>• gave realisation that fatigue life calculations very difficult and not very accurate. | |
| | Philosophy of "Fail Safe" began to grow - this all about mid 1950's - i.e. if design plane so if fatigue failure occurred, remainder of structure would carry normal loads (you would know failure had occurred) except up at high design loads. | Fail Safe. |
| | DCA paid for research at ARL - started testing Mustang wings, complete structures, etc, - much development in UK, USA and Australia from accidents which occurred in early 1950's. | ARL<br>Mustang. |
| | Another aircraft came on scene - "a regular fatigue machine" - Vickers Vicount built with DTD363 and a single spar - thus any failure disastrous as the Dove. Pre war aircraft had 2 or 3 spars. | Vickers Viscount.<br>Dove. |
| | Viscount - torsional stresses due engines which stuck out a long way. All through Viscount life on "tender hooks". Had Viscount accident at Port Hedland - grounded all 700 Series (with DTD363). | Port Hedland |
| | TAA had bought later model (720 series) which went back to old copper alloy -not ground these. | TAA |
| | Then the Fokker F27 - Engineer at TAA did sums on wing thickness - not thick enough and would have early failures. DCA analysed and agreed. TAA sent John Watkins (TAA Director of Engineering) plus | Fokker F27<br>John Watkins, TAA Director of Engineering. |

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| 266 | Peter Langford (representing Australian certifying authority) to Fokker and confronted Dutch authority equivalent to DCA. They not happy - agreed increase skin thickness at their cost.<br>Decision - Peter Langford returned via USA as Fokker had franchised Fairchild - they and USA authority (FAA - Federal Aeronautics Authority) decided do nothing. Significant that Fairchild F27 had skin failure in wing and Fokker never had any skin failures.<br>Comet crashes in 1950's - first airborne crash over Calcutta due aircraft in very bad weather. We not buy Comet - so did not find all details. Only two Comets crashed from fatigue - these from fatigue failures in fuselarge - windows critical areas.<br>Policy adopted here for metal fatigue and life of aircraft structures - been developed considerably and moved towards 'fail safe' using not sensitive materials and sufficient margins to allow for fatigue in critical areas. Stressed have to find failure and it usually hidden - this is bib difficulty.<br>As aircraft get older, could have more failures - mix of longer life and fail safe. | Fairchild.<br>FAA - Federal Aeronautics Authority (USA).<br><br>Comet.<br>Calcutta. |
| 393 | End of Tape IEA DWB 2, Side A | |

## Tape Log

| Tape: IEA SYD: DWB 2, Side B | | |
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| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-002 | Tape Identification | |
| | **1.2). Other safety Incidents or Events.**<br>Various incidents /events which have led to standards here or overseas being changed.<br>Impact that Australian Airworthiness group had internationally. | |
| 002-067 | **1.2.1). Ground Stall.**<br>Ground Stall led to accident at Karachi when a Comet - for delivery to Trans Canada Airlines (Comet 1 could not fly across Atlantic) - wings lost lift and aircraft failed to get air borne when taking off. Phenomenon occurs when angle of attack of wings rotates to above stall angle.<br>Comet was first aircraft not geometry limited.<br>All previous aircraft geometry limited, i.e. with tail down - wing angle of attack is below stall angle.<br>Australia interested because QANTAS had bought Boeing 707, Series 120 with shortened fuselarge from 100 Series aircraft certified by Americans.<br>.Shortened fuselarge increased angle on ground - felt was marginal. DCA required QANTAS and Boeing do 'tail scrape' test. Instrumented aircraft at Edwards Air Force Base (very long airstrip) and result very marginal - just about stalling as took off.<br>Result - Federal Aeronautics Authority (FAA) would not certify - put to Australia - you get it approved or not. QANTAS Technical Director (Dick Shaw) - in Seattle - phoned Peter Langford who travelled to USA and test done. Determined not totally critical and could be trained out by pilots - Australia certified aircraft and did not have any accidents with Boeing 707 Series 120.<br>As result, 'Tail Scrape' test introduced in Australia, also USA and UK for all aircraft which were not geometry limited. | Ground Stall.<br>Karachi.<br>Trans Canada Airlines.<br>Angle of Attack.<br>Stall Angle.<br>Comet.<br>Aircraft geometry limited.<br>QANTAS.<br>Boeing 707, Series 120.<br>DCA.<br>Tail Scrape Test.<br>Edwards Air Force Base.<br>Federal Aeronautics Authority (FAA).<br>QANTAS Technical Director (Dick Shaw). |
| 067-098 | **1.2.2). Viscount - Botany Bay accident.**<br>Aircraft dropped approximately 30,000feet vertically before it could be pulled out of a dive - plane landed safely - every bolt/ rivet strained !<br>Reason for dive had to be determined. - similar incident occurred to a Boeing 707 over Newfoundland. Reason determined by one of senior pilots of Trans World Airlines (TWA) who made the hypothesis that when fly into a gust, Air Traffic Control System demanded maintain altitude - if vertical up gust, must nose down aircraft to maintain altitude - when come out other side, do reverse.<br>Aircraft now so streamlined, when come out nose already pointing down and gaining speed very rapidly | Viscount, Botany Bay.<br>Boeing 707<br>Newfoundland.<br>Trans World Airlines (TWA).<br>gusts<br>Air Traffic Control. |

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| | and can not be pulled out if near ground. Wind shear often occurs near ground.<br>Operational requirements changed -maintain attitude not altitude-climb with gust & come down with gust. This not given as cause of Botany Bay incident - but is Peter Langford's strong view that it was. | Wind shear |
| 098-247 | **1.2.3). Stable position in Stall.**<br>British Aerospace aircraft - thinks was BAE 111 ?? - T-tailed with rear mounted engines and swept wings. Had some in RAAF VIP flight.<br>Manufactured in England and research people at RAE and ARB decided use aircraft for research as to what happened beyond stall. Reached stable position in stall - could not get out of stall - fell horizontally 30,000 feet - landed flat on tummy and all killed.<br>Later analysis showed at higher angles of attack, get blanketing of elevators by swept wings, rear engines and fact that tail is right up in air. Discussed this - showed there was stable position where there was no downward pitching moment available to aircraft.<br>At time we about take delivery Boeing 727 and Douglas DC9, both had same characteristics.<br>Caravelle in France also had same characteristics.<br>Peter Langford led team from two airlines involved (TAA and Ansett) to England, USA, France and Italy to discuss their experiences with particular phenomenon, included<br>• Peter Gibbs - Director of Operations - Ansett.<br>• Frank Austen - Deputy Director of Engineering - TAA.<br>• Alan Wallace - Senior Aerodynamicist with ARL.<br>England introduced "stick pusher" - vane on side of aircraft so when reached particular angle of attack, vane actuated hydraulically operated jack to push control column forward. Team did not like as took control out of pilot's hands and they not sure how could regain control. But became UK standard.<br>Went USA to Boeing and saw FAE (Airworthiness) people. Chief Test Pilot - Dick Slits (?) said in testing 727 - had fallen 30,000feet before getting out of deep stall. Not so interested in deep stall provided could prevent aircraft going into that position. More interested in being totally aware aircraft had stalled - did test flight and put in stall - considerable vibration no mistaking stall - discussed this and other aircraft..<br>When team back, wrote standard, combining British and American, - required no pitch up - it had to be at least neutral, preferably pitch down.<br>Boeing 727 was cleared.<br>DC9 not ready to be cleared - talked about this - subsequently found they needed leading edge flaps - these put on - tested to satisfaction - then DC9 cleared. | Stable position in Stall.<br>British Aerospace, BAE 111<br>RAAF VIP flight.<br>RAE (UK), ARB (UK).<br>Boeing 727<br>Douglas DC9<br>Caravelle, France.<br>Peter Gibbs - Director Operations (Ansett).<br>Frank Austen - Deputy Director Engineering (TAA).<br>Alan Wallace - Senior Aerodynamicist (ARL).<br>"Stick pusher"<br>Boeing, FAE.<br>Dick Slits (?) - Boeing Chief Test Pilot.<br>Leading edge flaps.<br>DC9 |

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| 247-403 | **1.2.4). Electra Wings (thinks mid 1960's).**<br>QANTAS, TAA, Ansett all had Lockheed Electras.<br>Electra in Buffalo (USA) crashed due wing falling off - failed either beteen the two engines or inboard - cannot recall. America decided reduce cruising speed - load on wing proportional to square of speed -to reduce loads on wings.<br>Then second Electra crashed in Indiana (USA) - same failure as first one.<br>Went to USA - got nowhere - heavy litigation on go.<br>Considered cause flutter set up due synchronous opposite movement of big engines which overhung wings. Outer engine going up while inner down - set up torsional load between engines in wing. Lockheed said this not cause.<br>Meeting in Lockheed factory<br>• Peter Langford.<br>• Frank Austen - TAA.<br>• John Bibo - Ansett.<br>• Ron Yates - QANTAS.<br>Lockheed expounded theory that none of Australians believed.<br>Continued on Tape IEA DWB 3 Side A. | Lockheed Electra.<br>Buffalo (USA).<br><br>Indiana (USA)<br><br>torsional load.<br><br>Frank Austen - TAA.<br>John Bibo - Ansett.<br>Ron Yates - QANTAS. |
| 403 | End of Tape IEA DWB 2 Side B | |

## Tape Log

| Tape: IEA SYD: DWB 3, Side A | | |
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| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-004 | Tape Identification | |
| 004-060 | 1.2.4). Electra Wings.....continued..... | |
| | Described Lockheed theory that Australians not believed - related to maintenance - bolts of engine mount joints to wing and engine mount joints from engine mount to engine relaxing and becoming loose. Nothing to do with manufacturer. | Lockheed |
| | Hastily called meeting with Australians and Cartland Gross (Lockheed President) and Bob Bailey (Lockheed Chief Designer) - company subsequently beefed up area where failure had occurred. This accepted as felt would make aircraft safe - no other failures since. | Cartland Gross (President Lockheed).<br>Bob Bailey Chief Designer - Lockheed). |
| 060-146 | **1.2.5). Light Aircraft Fatigue.** | Light aircraft fatigue |
| | None of the criteria developed for large passenger aircraft had been applied to light aircraft. Reason - all over designed because stability problems in skin meant certain skin thickness to stop buckling - lowered stresses. Could see generation of light aircraft coming up which would have fatigue problems. | |
| | Did sums on Beech Queen Air - result bit critical. Beech did tests on Beech King Air - B90 (High performance with turbo prop engines) - established could get fatigue failures and had them - started program of replacing spars even if looked OK. | Beech Queen Air.<br>Beech King Air - B90. |
| | Pipers, Cesnas, Beech all from America - DCA approached them but response no. So DCA applied standards to planes coming in from America - manufacturers got quite uptight. | Piper, Cesna, Beech.<br>DCA. |
| | British and European started applying same standards - USA manufacturers then started themselves - wanted FAA to issue requirement. | FAA |
| | Called conference of airworthiness authorities from around world - without fail all critical of USA standards. Peter Langford left airworthiness field at this time - for Regions - and not seen changes to standards<br>• FAR3 - light aircraft.<br>• FAR4 - large aircraft. | FAR3, FAR4. |
| 146-317 | **1.3). Airworthiness Inspections and Certification.** | Airworthiness Inspectors and Certification. |
| | Whole process of airworthiness inspection and certification developed over 30 years after World War II - discussed earlier in<br>• Tape IEA SYD DWB 1, Side A 273-373.<br>• Tape IEA SYD DWB 1, Side B 045-101. | |
| | At end WW II, aircraft inspectors inspected all works | |

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| | done - had to be there to check and certify. As civil aviation grew DCA not have staff, general maintenance and servicing of aircraft improved and DCA inspections became redundant. Discussed change from inspection to surveillance by DCA surveyors, organisations having appropriate paperwork in place, certification that work done. DCA set specialist examinations for licensed maintenance engineers. Process introduced gradually included DCA not approving designs but transferring responsibility to airlines engineers. Same system independently in America and England. Still need to certify aircraft initially - would accept certifications to American standards but wanted to be sure any additional requirements of Australian standards had been met. Whenever new aircraft came, sent certification team over - particularly in cases we did not know too well. System has proven satisfactory - very few failures due maintenance system. Accepting base certification, adding our own requirements and applying our system has been endorsed by various boards of inquiry to be in compliance with air navigation requirements - which say we shall be satisfied that the aircraft is a safe aircraft before we certify it. | DCA<br>Inspections<br>Surveillance.<br>Surveyors.<br>Airline engineers.<br>Air Navigation requirements. |
| | **2). Representing the Department overseas.** | |
| 317-400 | **2.1). British Commonwealth Aeronautical Advisory Research Council (BCAARC).** During World War II great co-operation in aviation between Britain and America. After WW II, British afraid they would lose contact with American research and not have capacity to do it themselves. Aeronautical Research Council in UK decided establish group people from British Commonwealth to supplement each other in research - eg. if country A does something, make available to country B. They set up BCAARC - members from major countries in British Commonwealth and included Canada. South Africa, India, Australia & New Zealand. Idea was Council meet every 3 or 4 years to review work being done in various countries and appoint coordinators in each area of research -eg. structures, engines, fuels, instruments, electrical, etc. Discussed how these people worked between Council meetings. First meeting in UK, second in Australia*, then UK, then Canada*, then India*(Bangalore - centre aero industry and University Chair in Aeronautical Engineering), New Zealand and again Australia. Peter Langford attended ones marked *. | British Commonwealth Aeronautical Advisory Council. (BCAARC).<br>British Commonwealth<br>Canada, South Africa, India, Australia, New Zealand.<br>Bangalore |
| 400 | End of Tape IEA DWB 3, Side A | |

## Tape Log

| Tape: IEA SYD: DWB 3, Side B | | |
|---|---|---|
| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-002 | Tape Identification | |
| 002-052 | **2.1). British Commonwealth Aeronautical Advisory Council - ..continued.....**<br>Described people who attended. Council meetings conducted by chairman from host country (research person).<br>Each country organisation did not interfere with work of researchers - did not direct them. Liaised between governments and researchers on technical basis - made suggestions in own spheres of operation where could do with research - Council discussed and if agree, referred to appropriate research people to decide if they do or not. Need person(s) keen to do, need money, need facilities.<br>BCAARC was an advisory body.<br>Benefits to Australia - in research field to keep up to date on what going on - perhaps more in RAAF area. | British Commonwealth Aeronautical Advisory Council (BCAARC).<br><br>RAAF |
| 052-184 | **2.2). International Civil Aviation Organisation (ICAO).**<br>Function - to standardise aviation procedures worldwide - most critical areas were those which involved aeroplanes flying from one country to another, for example,<br>• Air traffic control.<br>• Airport standards.<br>• Performance standards.<br>• Operational standards.<br>Headquarters of ICAO was Montreal..<br>Organisation comprised :<br>• Council (met in Montreal) which had a Secretariate comprising representatives of countries (not each country had member) - from Australia, Dr. K.N.E.(Bill) Bradfield went twice.<br>• several Commissions - working bodies of technical people - Airworthiness came under Air Navigation Commission.<br>• ad hoc meetings.<br>Peter Langford attended twice and was Vice Chairman 3rd Navigation Conference in 1956 at which proposed set common standards be prepared - result set up Airworthiness Committee to meet in six months time. Australian delegates were Peter Langford (airworthiness), Len Jacoby (operational) and Alan Hepburn (Australian Council member).<br>First meeting - agreed could not write standard, but write advisory information - turned out to be complete waste of time. | International Civil Aviation Organisation (ICAO).<br><br>Aviation procedures.<br><br>Air traffic Control.<br>Airport standards.<br>Performance standards.<br>Operational standards.<br><br>Montreal<br><br>Dr. K.N.E. (Bill) Bradfield<br><br>Air Navigation Commission<br>Airworthiness.<br><br>Len Jacoby<br>Alan Hepburn. |

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| | Another meeting (1957) - called to look at Acceptable Means of Compliance (AMC's).<br>Other meetings Airworthiness committee - USA and UK could not agree on standard as each wanted own - so fell through.<br>Does useful work in other areas ,but not in airworthiness. | Acceptable Means of Compliance (AMC's) |
| 184-255 | **2.3). Tri-partite Airworthiness Co-operation Conference between Britain, India and Australia.**<br>Ad hoc conference brought about by three British airlines (BOAC, Air India, QANTAS) involved in 'kangaroo route' between Britain and Australia.<br>Each used others maintenance bases in areas of activity, but maintenance of aircraft was still required to be done in accordance with requirements of the country of registration - eg. QANTAS may have some mandatory requirement for replacement engine and replacement engine to be put in in India may not comply. Caused inconvenience, cost, delays to each of three airlines.<br>Airlines asked the three registration authorities,<br>• Air Registration Board - UK.<br>• DGCA - India.<br>• DCA - Australia.<br>to meet Chief Engineers of three airlines to see what could be done to relieve situation. Peter Langford (DCA) went with Ernie Aldis (Chief Engineer QANTAS).<br>Resolved a lot - still lot not resolved - operation was much smoother from then on.<br>Nothing been done subsequently - but standards of three countries have come closer. | Tri- partite Airworthiness Co-operation Conference.<br>Britain, India, Australia.<br>BOAC, Air India, QANTAS.<br>'kangaroo route'<br>maintenance<br>Air Registration Board - UK.<br>DGCA - India.<br>DCA - Australia.<br>Ernie Aldis (Chief Engineer - QANTAS) |
| 255-399 | **2.4). To India in 1963 at request of President of India to advise on complete reorganisation of that country's Airworthiness Control System.**<br>In 1963, India still using airworthiness system as was used in Australia in 1946 - i.e. everything had to be inspected by an inspector from the department.<br>Air India being handicapped - other country's airlines more streamlined.<br>After inter government arrangement, went India - our system commensurate in size - 3 weeks visiting towns with substantial facilities, particularly Bombay (Air India's main base) and Delhi (India Airlines base).<br>Problem was delegating authority. Recommended Australian system, but adapted to suit their towns, their culture and requirements.<br>Subsequently heard System implemented - basically still in operation, although feel may have slipped back a bit. | India's Airworthiness Control System.<br>Bombay - Air India's base.<br>Delhi - India Airlines base. |
| 399 | End of Tape IEA DWB 3, Side B. | |

## Tape Log

| Tape: IEA SYD: DWB 4, Side A | | |
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| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-004 | Tape Identification | |
| 004-017 | **2.5). Other Airworthiness Control Systems re-organisations.**<br>Stemming from visit to India (see previous item 2.4), Malaysia and Singapore Airlines saw necessity to do something similar - two people in Department did similar thing<br>• Ron Ferri did Singapore.<br>• Wally Miles did Malaysia. | Airworthiness Control Systems in Singapore and Malaysia. |
| | **MEMBERSHIPS:** | |
| 017-034 | * **Australian Aeronautical Research Council** Member 1957 - 1973.<br>Refer previous Tape IEA DWB 3, Side A 317-400 comments on British Aeronautical Advisory Research Council. and work it did.<br>Chairman usually Professor of Aeronautical Engineering or Head of ARL. Main people involved were those in main research facilities, such as<br>• Universities<br>• ARL<br>• High Speed Aerodynamics Laboratory (Salisbury).<br>• Woomera Rocket Range.<br>DCA were 'requesters' and users of information. | Australian Aeronautical Research Council<br>British Aeronautical Advisory Research Council<br>ARL<br>High Speed Aerodynamics Laboratory (Salisbury).<br>Woomera Rocket Range. |
| 034-092 | * **The Royal Aeronautical Society** - Fellow.<br>President Australian Division 1969 - 1971.<br>British organisation, in parallel to Institute of Mechanical Engineers, etc..<br>Is aimed at embracing all activities associated with aviation industries - contains people knowledgeable in flying, navigation, instrumentation, engineering, etc..<br>Requirement for membership much same as Institution of Engineers, Australia.<br>Started in Australia about 1960 - Geoff Dawson got Local Branch moving. | The Royal Aeronautical Society<br>Royal Aeronautical Society, Local Branch.<br>Geoff Dawson |
| 092-120 | * **The American Institute of Astronautics & Aeronautics** - Fellow.<br>Resigned 1983 when retired.<br>American equivalent of Royal Aero Society.<br>Astronautics added in late 1950's.<br>Explained how he became fellow - DCA Librarian found cheaper to pay subscription for a member than buy journals - member received journals free. | The American Institute of Astronautics & Aeronautics. |

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| 120-136 | * **The Institution of Engineers, Australia.**<br>Was Associate Member<br>Involved in Aeronautical Branch - left IEAust when full commitment to Royal Aeronautical Society. | The Institution of Engineers, Australia. |
| 136-291 | * **Haileybury College, Melbourne.**<br>1958 - 1976 member of Governing Council.<br>Made "Life Governor" in 1976.<br>Formed very large part of extra curricular life.<br>Haileybury College named after school in Bedfordshire, England. Substantial school located in grounds of old East India Company - quite an historical set of buildings.<br>Started in Brighton (Victoria) about 100 years ago by an ex master of the English college.<br>Hailebury has motto out here of "In alta ilterra" which means "In another land".<br>Outlined initial involvement in school, joining fathers' association, school council, invitation to school to join Council of Schools (about 1958) - association of schools equivalent to GPS schools in Sydney, need for school size to be increased and the setting up of a completely new school for 1,600 boys on a new green field campus at Keysborough. Became Chairman of Property Committee from day one when decided to build new school (previous person left) and remained in that position for whole period of construction of new school. - interesting and time consuming big job. Always felt had beautiful oval and second class change rooms, needed proper pavilion - funds always prioritised to build another class room. Left school council in 1976 when moved to Sydney - pavilion not built.. Made "Life Governor" when left council - about 10 or 12 at that time - position of honour - thanks for people who have done something for school. Later (about 1978 ?), letter from Chairman of Council - eventually building pavilion - knew Peter Langford's great interest- wondered if would consent to it being called "Langford Pavilion" and come down with wife and open it. So pavilion exists. | Haileybury College, Melbourne.<br>Bedfordshire, England.<br>East India Company.<br>Brighton, Victoria.<br>Keysborough.<br>Langford Pavilion. |
| 291-366 | **AWARDS:**<br>**Member in the General Division of The Order of Australia** - Australia Day Awards 1985.<br>awarded for services to Aviation Safety.<br>Talked about how he felt to receive award.<br>Presented by Sir James Rowlands - had been year behind Peter Langford at Sydney University and talked their continued association and friendship. | Member in the General Division of The Order of Australia.<br>Sir James Rowlands |
| 366 | End of Tape IEA DWB 4, Side A | |

## Tape Log

| Tape: IEA SYD: DWB 4, Side B. | | |
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| **COUNT** | **SUBJECT** | **NAMES & KEYWORDS** |
| 000-002 | Tape Identification | |
| 002-029 | **OTHER MATTERS:**<br><br>**a). Original author of the four aviation biographies in book "THE ENGINEERS 200 years at Work for Australia" - published by The Institution of Engineers, Australia in 1988.**<br>• Lawrence Hargrave : Father of Australian Aeronautical Engineering - Pages 100 - 103.<br>• Lawrence Wackett sees production engineering as the key - Pages 168 - 170.<br>• John Watkins : Aircraft judge extraordinaire - Pages 204 - 205.<br>• Sir James Rowlands : Engineer who become State Governor - Pages 220 - 221.<br>Articles in book are edited versions of Peter Langford's original work. Had been asked to deal with four engineers representing the various types of aeronautical engineering practiced in this country, as follows (in above order) :<br>• Research.<br>• Manufacture.<br>• Civil aviation.<br>• Service aviation. | Book - "THE ENGINEERS 200 years at Work for Australia".<br><br>Lawrence Hargrave.<br><br>Lawrence Wackett.<br><br>John Watkins.<br><br>Sir James Rowlands. |
| 029-082 | **b). Technical papers and lectures** - talked generally about these and what initiated them :<br>• Had some 20 papers published in Australia and overseas - gave all his copies to historical society in the Department - held in their archives.<br>• Delivered some 15 technical lectures to various learned societies both in Australia and overseas. In 1975 delivered the 'Lawrence Hargrave Lecture' to the Melbourne Branch of the Royal Aeronautical Society - entitled "The Principles and Practices of Airworthiness Control". | 'Lawrence Hargrave Lecture'<br><br>Airworthiness Control. |
| 082-093 | End of Tape IEA DWB 4, Side B.<br>**Close of Interview / Review.** | |